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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE

A SCIENCE SERVICE PUBLICATION

MEDICINE

USSR Uses Sabin Vaccine

THE SABIN live polio virus vaccine, developed in the United States but not yet licensed here, is "completely harmless" and extremely effective, Russian scientists have found. They have already immunized millions of children in the USSR with the live vaccine.

The Salk inactivated vaccine, licensed in the United States, was called a "wasteful preparation."

The Russian scientists spoke at the Second International Conference on Live Poliovirus Vaccines in Washington, D. C. They said:

"Nowadays large-scale production of the complex, expensive and insufficiently effective Salk vaccine, which involves additional scarring of children because of the repeated injections required, is quite unnecessary." The Russians said the Salk vaccine can be replaced by "a more effective, completely harmless live vaccine for oral administration."

The scientists said they had been particularly careful to study the possibility that the attenuated Sabin strains might turn into dangerous virus forms.

They found the live vaccine to be "completely harmless." There is "no threat of the vaccine strains' reversion to a more virulent state."

They advised that the live vaccine be made compulsory, as in the case of smallpox and diphtheria in many areas. Only this method, they said, will enable a country to gradually eliminate the polio viruses themselves and suppress their circulation.

(The live vaccine not only immunizes, it interrupts the life cycle of the polio virus and thus could destroy the viruses themselves in areas where masses of people are vaccinated.)

They suggested three oral doses of vaccine administered four to six weeks apart.

The vaccine primarily used in the Russian tests has been that developed by Dr. Albert B. Sabin of Cincinnati, Ohio.

The Russian scientists reporting were from the USSR Academy of Medical Sciences in Leningrad. The scientists are A. A. Smorodintsev, A. I. Drobyshevskaya, N. P. Bulychev, O. M. Chalkina, G. M. Groisman, V. I. Ilyenko, R. A. Kantorovich, L. M. Kurnosova, K. G. Vasilyev, V. I. Votyakov and G. P. Zhilova.

Science News Letter, June 18, 1960

MEDICINE

Polio Vaccine Delay

THE U. S. Public Health Service is being urged by Dr. Albert B. Sabin, of Cincinnati, Ohio, to license his live poliovirus vaccine at once. Several drug companies are ready to apply for licensure but await specific requirements from PHS. His vaccine has been safely used by millions, chiefly in other countries.

In an exclusive interview, Dr. Sabin told SCIENCE SERVICE the PHS must face the issue of whether it will be satisfied with the indefinite results of the Salk polio vaccine or use the live, orally administered form that he believes will completely eradicate polio in this country.

These were questions answered by Dr. Sabin:

Q. What is keeping the U. S. Public Health Service from licensing your vaccine?

A. Caution that is unnecessary on the basis of tests already made. Other countries do not have the problems we have here of competing methods.

Q. Do you have any encouragement from the PHS that licensing can take place soon?

A. I had a letter recently from the Surgeon General's office saying "with all the information we have we should be able to receive applications for licensure this fall."

Q. What drug companies are ready to apply?

A. A number of companies, including Wyeth of Philadelphia and Pitman-Moore of Indianapolis, have spent a great deal of money in preparing my vaccine but they are at a standstill until the PHS is specific in its requirements. I have just returned from London where the International Pfizer Company and others have received specific requirements from Britain's Medical Research Council and Ministry of Health, but even they await the decision of the United States because the requirements should coincide if sales are to be international.

Q. Do you believe that drug companies' competition is holding back the use of the oral vaccine?

A. No. I do not believe they are afraid of the inevitable economic loss if Salk vaccine goes off the market. It is true that fewer companies will be needed to produce this comparatively simple vaccine—100 doses can be prepared compared to one Salk shot. One plant in Russia can produce enough for her population. One American company could make enough for our country at low cost.

Q. Is not the Public Health Service justified in its caution in awaiting further tests?

A. No further tests are necessary to throw light on the safety of the Sabin vaccine. In my paper at the International Conference on Live Poliovirus Vaccines I show that even in the subtropical conditions where economic underdevelopment poses health hazards of other virus infections, we can stop the spread of polio. We could not prove this at the meeting last year.

Q. As an American born in Russia, how do you feel about the fact that Russia has forged ahead in the use of your vaccine?

A. I am highly gratified. This has nothing to do with Russia's political organization but is due to the leadership of one public-spirited man, Prof. Mikhail P. Chumakov, director of the Institute for Poliomyelitis Research of the USSR Academy of Medical Sciences. I have been in Russia four times in recent years and I found the same indecisive way that we have in dealing with the polio question until Dr. Chumakov got the support of his ministers of health.

Q. Can you name any examples of leaders in promoting the use of live polio virus vaccine in this country?

A. Dr. Herman E. Hilleboe, New York State Commissioner of Health, is one. The Department of Health in Cincinnati is another.

Q. What has been done in Cincinnati?

A. Since April we have given 185,000 preschool and school children the Sabin vaccine safely. Physicians gave their time to feed vaccine to 50,000 pre-school children in one week. The rest were given vaccine in clinics, beginning with the first and most dangerous of the three strains. Eighty-five percent of the epidemics are caused by this strain. Second and third doses will be given later.

Q. Do you approve of the one-shot dose of vaccine (trivalent) containing all three strains?

A. The Cox and Koprowski virus vaccines have not had the extensive tests that mine have had, and they should not be recommended because of weaknesses found.

Q. If licensing of your vaccine is done in the United States, should it be under the direction of boards of health as smallpox vaccination now is?

A. Yes, I would recommend the Cincinnati system, giving live polio virus vaccine at two-month intervals beginning in December, with strain I, III and II given rather than the one-shot (trivalent) dose.

Science News Letter, June 18, 1960

Safety Proof Needed

THE U. S. Public Health Service will not license live poliovirus vaccine until its safety has been further demonstrated. Dr. Roderick Murray, chief of the Division of Biologics Standards, National Institutes of Health, is head of a committee appointed by Dr. Leroy E. Burney, which will study the reports submitted at the Second International Conference on Live Poliovirus Vaccines held at Georgetown University, Washington, D. C.

If the committee finds that sufficient tests have been made to prove its safety for communities as well as individuals inoculated with the vaccine by mouth, it will recommend that PHS go ahead with licensure.

Dr. David E. Price, assistant Surgeon General of PHS and head of the U. S. delegation to the International Conference on Live Poliovirus Vaccines in Moscow last May, said at that time that Russian results were promising but that there were still unanswered questions that Soviet data did not provide.

The caution of the PHS in licensing stems from trouble with the Salk vaccine five years ago. Dr. William J. Zukel, assistant to Dr. Burney, said the outlook was promising for the live vaccine.

Science News Letter, June 18, 1960

MEDICINE

Live Polio Vaccine Used

Live polio vaccine has been used for millions of persons outside the U. S. Series of doses were used in Costa Rica. Test areas in the U. S. reported the vaccine effective.

MORE THAN 60,000,000 persons outside the United States have been vaccinated with live polio virus vaccine developed by Americans but not yet licensed for use in the U. S., a chief medical officer of the World Health Organization reported.

Dr. A. M.-M. Payne said the acceptance abroad was partly a matter of economics.

He reported that Americans can afford the three-shot Salk vaccine in which the viruses are not alive. But other nations have gone ahead successfully with the live vaccine (which is not unanimously accepted as being as safe as Salk's) because it is cheaper and easier to use. (It takes just one oral dose of the live vaccine to immunize.)

The USSR, Poland, East Germany, Czechoslovakia, Hungary, the Netherlands, Sweden, the United Kingdom and some Latin American nations have used the live vaccine.

Dr. Payne spoke during sessions of the Second International Conference on Live Poliovirus Vaccines held at Georgetown University, Washington, D. C. About 95 polio experts from 20 nations attended.

Dr. Joseph L. Melnick of the Baylor University College of Medicine, Houston, Tex., explained laboratory experiments on monkeys are still important in determining the live vaccine's safety.

But, he added, the ultimate test of the safety of live vaccines rests in long-term studies of its use on human beings, such as those populations already vaccinated.

The live vaccines discussed usually are administered in the form of a fruit-flavored syrup or in capsules or pills.

The conference was sponsored by the Pan American Health Organization and the World Health Organization, with the assistance of the Sister Elizabeth Kenny Foundation of Minneapolis, Minn.

Science News Letter, June 18, 1960

Test Shows Vaccine Safe

THE MIAMI physician who directed mass tests of a new oral polio vaccine—simpler and cheaper than the Salk vaccine—reported that no evidence of harm to individual or to community has been observed.

Dr. M. Eugene Flipse of the University of Miami said the Cox vaccine has been proved effective by a study of its experimental use on 410,000 volunteers in the Miami area.

Dr. Flipse spoke at a session of the Second International Conference on Live Poliovirus Vaccines held at Georgetown University, Washington, D. C.

He said blood tests of 2,500 persons showed the vaccine was 92.3% effective in building antibodies against the three strains of paralyzing polio.

The Cox vaccine, one of several new live vaccines for which licensing is now sought in the United States, is taken in one oral dose. It contains three types of live polio virus.

Type I virus and Type III are responsible for perhaps 90% of the world's paralytic polio.

The Cox vaccine was reported as 95% effective against Type I and 97.2% effective against Type III. It was only 78.3% effective against Type II.

Dr. Herald R. Cox of the Lederle Laboratories developed the vaccine tested. With it, more than 80% of the under-40 population of Dade County (the Miami area) have been vaccinated on a voluntary basis. The Cox vaccine has not been licensed, however, for general use for fear the harmless virus in the vaccine might go awry and become dangerous.

The Dade County study is not yet complete. Sewage samples have been collected and will be examined for the presence of polio viruses.

The meeting heard two reports on tests of live virus vaccines in Minnesota.

In one, the safety of the Cox live polio virus vaccine was asserted on the basis of tests of 165 volunteers at St. Cloud Reformatory.

The second study, also of the Cox vaccine, was made with families at the University of Minnesota. The study showed that a live-vaccinated member of a family "infects" other members of his family with immunity to polio. The immunity spreads like a disease.

The study showed the immunity did not spread much outside the family group because of less frequent contact.

Altogether, more than half a million Americans have voluntarily taken live polio virus vaccines to demonstrate their effects on families and communities.

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Series of Doses Used

A SERIES of oral doses of live polio virus vaccines appears to be more effective than one-dose vaccines in building immunity against polio, a study in Costa Rica shows.

Licensing of one-dose live virus vaccines for protection against all three paralytic types is now being sought. But Dr. Dorothy M. Horstmann of the Yale School of Medicine told the Second International Conference on Live Poliovirus Vaccines:

1. In vaccines that combine three live virus strains, one often dominates. The vaccinated person is thus not always protected against all three types of paralytic polio. (Type III strain dominates in the Cox vaccine, Type II in the Sabin.)

2. Thus, attention should be given to adjusting the amount of each type in a combination vaccine to allow for the types' varying infectiousness.

3. Until the proper combination has been worked out, the three types administered separately (perhaps with a follow-up of combination vaccine) would seem to be the most effective way to get full immunity.

With three associates, Dr. Horstmann studied vaccinated children in a village near San Jose, Costa Rica.

Science News Letter, June 18, 1960

MEDICINE

Big Polio Decline Reported in Britain

THE MINISTRY of Health in Great Britain has summed up 1959 as the best year for health in a long time. Most notable was the dramatic decline in poliomyelitis.

There were 86 polio deaths in Great Britain, compared with 147 in 1958 and 246 in 1957. "How far this improved position was the result of the rising level of anti-polio vaccination it will always be impossible to estimate," says the Ministry. The Medical Research Council is, however, making a careful check on the experience of the vaccinated and the unvaccinated, which may perhaps reveal how far vaccination does provide protection.

The Ministry's statistics show that good progress was made in giving polio protection to young people. By Christmas, 74% in the most susceptible group, those aged up to 16, had received two or more polio injections.

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BULB POLISHING—The bulb of an electron tube is polished by a revolving abrasive coated with polishing rouge. This is the last step in a sealing technique, polyoptic sealing, that increases the tube's reliability. The process is being investigated at Chatham Electronics, division of Tung-Sol Electric Inc., Livingston, N. J., for the Army.

MEDICINE

Clay-Eating Illness

GEORGIA WOMEN who crave and actually eat a local clay during pregnancies are twice as likely as most people to get a mysterious illness called sarcoidosis.

The clay-sarcoidosis link was reported at a three-day international conference held at the National Academy of Sciences in Washington, D. C. All sessions were devoted to the mysterious disease which mimics tuberculosis, certain industrial diseases such as beryllium poisoning and certain fungus diseases.

Drs. G. W. Comstock, H. J. Keltz and D. J. Sencer, all of the U. S. Public Health Service, reported, "The type of clay most desired for eating appears to be concentrated in the areas where sarcoidosis is most prevalent.

"In addition, this clay contains appreciable amounts of beryllium."

Sarcoidosis is detected principally by chest X-rays. Its symptoms can be lung trouble, swollen glands or skin rashes. The illness can strike any body organ.

About 75% of the victims recover spontaneously. The remaining 25% develop disability ranging from chronic cough to a crippling of the lungs followed by death.

There is no known cure for sarcoidosis, although cortisone-like drugs have proved helpful in preventing further damage to the eyes, heart and central nervous system of sufferers.

The disease claims 200 lives annually in the United States. It has an incidence here of some four to five persons for each 10,000 of the population. Just how widespread is the disease throughout the nations of the world is unknown. The conferees agreed that the figures for the United States were educated guesses and that sarcoidosis is probably much more common than realized.

Paradoxically, the disease is most commonly found in widely separated geographical areas. In the U. S. it is most commonly found among Negroes. In some areas the rate runs as high as 18 Negroes to one white person. However, the disease is also present in Scandinavia, where there is no Negro population.

Although the cause of sarcoidosis is not known, there are theories to explain its origin. The hypothesis being most widely investigated is the relationship between sensitivity to pine tree pollen and sarcoidosis. It has been shown in the U. S. there is an ecological relationship between regions where the illness is most prevalent and pine forests. Laboratory studies have also shown pine pollen can cause a certain biological reaction similar to that caused by the germ responsible for tuberculosis. In some nations, however, similar studies failed to show such a neat relationship.

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DERMATOLOGY

Soap Gets Under Your Skin

CLEANLINESS may be next to godliness, but soap sometimes causes people trouble, Dr. F. Ray Bettley, physician for diseases of the skin at Middlesex Hospital, London, suggests. He reports studies showing that soap may increase skin permeability and thus allow alkali to reach and irritate cells below the surface of the skin.

Thus, barrier creams that have soap bases should not be used by industrial workers, Dr. Bettley reports in the June 4, 1960, issue of the British Medical Journal. The creams, far from preventing industrial dermatitis, may substantially increase the risk.

Dr. Bettley also reports a series of experiments that indicate less harmful effects to the deep cells of the skin from certain detergents.

He says commercial soaps have generally good antiseptic properties but perhaps more important than this is their ability to wash away the germs on the surface of the hands.

Washing with soap tends to destroy the self-sterilizing power of the skin by lowering its acidity. Dr. Bettley says, but also leaves behind a deposit that may in some degree make up for the loss.

The various effects of washing with soap are antagonistic, he points out, and says that furunculosis, associated with boils, commonly affects the areas of the skin that are washed most frequently. The avoidance of shaving soap is often sufficient to cure folliculitis, a disease of the hair glands.

However, Dr. Bettley has used a cleanser composed of five percent toilet soap and five percent pure potassium palmitate in the treatment of eczema and other skin diseases. Over a period of one month, patients, nurses and doctors found no irritation except when the cleanser was used in contact with ulcerated surfaces.

"I do not wish to imply that soap plays no part in hand eczemas," he wrote, "but the observations I have mentioned indicate a need for caution in arriving at general conclusions."

In the case of housewives who use soap, he says he has found no proof that irritation results, and "the effect of rubber gloves is often, I think, clearly more harmful still."

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MEDICINE

Rheumatism, Arthritis Helped by New Drug

A DRUG, triamcinolone acetonide (Kenalog), produces better results than hydrocortisone in the treatment of rheumatism and arthritis, Dr. Emil D. W. Hauser of Chicago reports.

Sharp reduction of pain and swelling and increased ease of movement were noted in all but one of 67 patients. No side effects were seen in spite of frequent dosage.

In the Journal of the American Medical Association, 173:487, 1960, Dr. Hauser says the new drug, injected into the fluid of joint cavities, has a high potency in small dosage.

Eighteen men and 49 women, ranging in age from 19 to 85 years, showing prominent symptoms of swelling, pain and tenderness with limited motion in either a joint or a bursa—cavity filled with fluid—were selected for the study.

Dr. Hauser warns that infection should be guarded against by strict "aseptic techniques."

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ASTRONAUTICS

Remote-Controlled Robots

REMOTE-CONTROLLED robots that can repair each other as well as equipment will some day serve as crew members of vehicles exploring space, a scientist predicted.

Dr. Fred L. Whipple, director of the Smithsonian Institution's Astrophysical Observatory, Cambridge, Mass., said such robots could do anything a man can do "at far less expense, weight and emotional concern."

He told the House Committee on Science and Astronautics in Washington, D. C., that the robots could be supervised and guided from the earth by television. Since a major problem of space exploration is reliability of equipment, robots that repair each other and their equipment would be reliable, at least to the distance where communication by television is possible.

Dr. Whipple's forecast of robots as future space explorers was presented at the House Committee hearings as one example supporting his view that the Government should strengthen its programs for engineering and research in the space sciences.

He also pointed out that for many astronomical experiments balloons were superior to space satellites.

"Dollar for dollar," he said, adequately supported balloon experiments should "pay off at somewhere between 10 and 100 to one over satellites in terms of space science results."

Structure Unknown

Just at the time man is almost ready to leave the earth and go into space, he is becoming aware of how little he knows about the earth, Dr. Roger Revelle, director of Scripps Institution of Oceanography, La Jolla, Calif., told the House Committee. Dr. Revelle said he doubted very seriously if many of the usually accepted theories concerning the earth and its deep interior would stand up if more were known about conditions.

The plan to drill a hole through the earth's crust from an ocean platform, known as the "Mohole Project," would give answers to such questions as what kinds of rocks form the mantle, Dr. Revelle said. He urged a greatly expanded program of oceanographic research by the United States, citing the growth of Peru from a non-fishing nation to the second largest in the world as an example of practical benefits that could result from more knowledge about the ocean and its currents.

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ENGINEERING

Surveys of Mars Predicted

SPACE CRAFT with eight men aboard could make short survey flights to Mars and Venus by 1970 or 1971, Krafft Ehricke, program director for Convair Astronautics in San Diego, Calif., reported.

The flights depend on the United States developing nuclear heat exchange engines by 1965 and using them for trips to the moon from 1965 to 1970, Mr. Ehricke said.

He outlined a Venus flight plan in which men would travel 295 days, survey from their ship for 24 days and return in 223 days. Travel time to Mars would be less: 138 days to reach the planet and 175 days to return, he told the semi-annual meeting and aviation conference of the American Society of Mechanical Engineers in Dallas, Tex.

Mr. Ehricke predicted that the first surveyors would not land on the planets unless they had political reasons to do so. A landing, he said, would take extra personnel and would require rockets with double the payload capacity of those needed for surveys.

Artificial Brain Predicted

Other scientists predicted the possibility, far in the future, of programming an electronic computer to simulate a human brain.

Ralph W. Stacey and Norman A. Coulter Jr., associate and assistant professors respectively at Ohio State University, reported to the meeting and aviation conference of the American Society of Mechanical Engineers in Dallas, Tex., that electrical impulses have recently been used to simulate the behavior of artery pulses.

They said a doctor can feed data on a patient's arterial system into a computer and compare it with the normal artery data already fed the electronic machine. The doctor thus learns if his patient's system is normal.

"The ultimate step in the process of simulation would be the design of an artificial brain."

The professors said this was far beyond present knowledge but not really far fetched:

"We already have artificial organs which can take over the function of one part of the the brain, the respiratory center. Can we someday, when we understand the brain better, achieve what would amount to artificial metempsychosis—a transfer of human personality from a natural to an artificial brain?"

Science News Letter, June 18, 1960

ASTRONOMY

Newton's Theory Holds: Mass of Saturn Wrong

A SUGGESTION that Newton's theory of gravitation, used to predict the motions of planets, might be wrong has itself been found to be wrong.

The fault is due to a small error in the value of the mass for Saturn, a neighboring planet whose attraction greatly influences the motion of Jupiter.

Drs. R. H. Krotkov and R. H. Dicke of Princeton University called attention in 1959 to a small difference between the observed and predicted motions of Jupiter. Sometimes this planet appeared to be ahead of where it should be, sometimes behind.

The difference changes regularly with time and goes through a complete cycle once every 12.4 years. The effect is small, since Jupiter never appears more than 600 miles from its predicted orbit.

The effect has now been explained by Dr. G. M. Clemence, director of the U. S. Naval Observatory's Nautical Almanac Office in Washington, D. C. He says it is due to a small error in the adopted value of Saturn's mass. The discrepancy is removed if Saturn's mass is taken as one over 3499.7 that of the sun, it is reported in Sky and Telescope, 19:472, 1960.

Science News Letter, June 18, 1960

ASTRONOMY

Shells Around Suns May Have Been Built

INTELLIGENT BEINGS in another solar system could have hidden their sun by knocking their planets apart and using the pieces to build a hollow ball around their sun.

Dr. Freeman J. Dyson of the Institute for Advanced Study, Princeton, N. J., says that other civilizations may be millions of years ahead of the earth. They may have rearranged their solar systems to meet the needs of their exploding populations.

A hollow ball built around the sun would solve the space and energy problems. It would also cut off the sun's light. To detect such an advanced civilization, earthlings would have to detect the invisible heat radiation from the hollow ball.

A search for such infrared radiation should be coordinated with Project Ozma, a program now underway for detecting artificial radio waves from nearby stars, Dr. Dyson reports in Science, 131:1667, 1960.

Using our own solar system as an example, Dr. Dyson calculates that it would take about 3,000 years for population and technology to expand one trillion times at the rate of one percent a year. Pressures of population and energy needs could be met only by trapping all of the sun's radiated energy.

To trap the energy, earthlings could knock apart the planet Jupiter and rearrange it as a hollow ball about 10 feet thick with a diameter twice the size of the earth's orbit. This would take all the energy given off by the sun in 800 years. Such a sphere would be "comfortably habitable."

Dr. Dyson states he is not suggesting that this is what will happen in the solar system, but only proposes what may have happened in other stellar systems.

Science News Letter, June 18, 1960

TECHNOLOGY

Ike to See Tokyo Plant

WHEN PRESIDENT EISENHOWER visits teeming, energetic Tokyo, accelerating its industries in world competition, he will see one of its expanding electronic plants based firmly on American science and technology.

For 30 minutes, according to plan, Ike will go through a just completed factory building in which blue-garbed girls make transistors and fit them into very modern radios and tape recorders to be sold largely outside of Japan.

Compact sections of the manufacturing and production lines are being moved and streamlined so the President can see as much as possible in a half hour.

He will see the glowing red heat of growing germanium crystals, the heart of the transistor, tended by young men, almost the only operation not performed by girls. The crystals are sliced and then fitted with wires attached to their sensitive points under the microscope. This patient and careful work is performed by girls of high school age.

Then President Eisenhower will be shown an assembly line where big and little transistor radios and stereophonic tape recorders are put together by the same kind of blue-uniformed girls.

Advanced technological application, the latest machinery in production and testing, and effective but cheap female labor paternalistically handled—these are the ingredients of Japanese industrial success the President will be shown.

A preview of the planned Presidential visit showed the high quality of the engineering design revisions undertaken in the production areas by groups of engineers.

The pace of electronics design and production will be realized when it is recalled that transistors are less than a decade old and even now devices called diodes are threatening them with the fate of the electronic tube.

The girls who do the manual work, often extremely skilled, can be mistaken by a visitor for girls just out of school classes. They are largely fresh from the farms of Japan, they live in dormitories like those of boarding schools and they are watched over by company-paid house-mothers as carefully as they would be at home. Recruited at the age of about 17, they are trained and then work two to four years, after which they usually go home to marry.

SONY is the name of this electronics concern and this name is one of the few words on Japanese signs that is written in English. The engineers who founded SONY just after World War II, led by its president, M. Ibuka, had done electronic work in the Japanese war effort. Seizing upon the fundamental discoveries largely from America, SONY has become a major undertaking.

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ENGINEERING

Transport by Air-Trains

TWO ENGINEERS reported progress toward a new kind of land transportation that may be better than trains, automobiles or planes for quick trips between nearby cities.

The new transport is called a levacar. It is mounted on tracks, but a stream of compressed air about the tracks lifts the levacar a fraction of an inch above the track surface. This reduces friction.

An airplane-type engine pushes the levacar along.

In their paper prepared for the American Society of Mechanical Engineers meeting in Dallas, Tex., Alex L. Haynes and David J. Jay, both of Ford Motor Company, said the company has already built experimental levacars and continues to develop the levacar idea.

Mr. Haynes and Mr. Jay believe the levacars could have central terminals in cities and thus eliminate long trips to outlying airports. They said the levacars could probably travel between 200 and 500 miles an hour.

"Where two or three cities are located within 200 miles of each other, the reduction of travel time between these cities to commuting time will bring these cities together into the same business community."

"To date we have established the feasibility of the system and are continuing to develop the technology. We know that, given a reasonable amount of time, personnel and money, a working system could be installed."

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Monorails Criticized

A consulting engineer criticized yesterday's dream transport, the monorail, as unsound. The statement was not designed to please the mechanical engineers' host city, which has installed one of the few operating monorails in the United States.

But William H. T. Holden, a consulting engineer from Pasadena, Calif., told the American Society of Mechanical Engineers meeting in Dallas, Tex., that monorails have disadvantages that "in the judgment of the majority of qualified and responsible engineers" outweigh its advantages.

"In Europe, there is an international organization for transit problems, and this has studied monorail in the past and is no longer devoting much time to this activity. Here, we have repetitious studies by various consultants, and each metropolitan area has to do the job over and over.

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GENERAL SCIENCE

House Bill Asks Study Of Metric Advantages

A BILL authorizing the National Bureau of Standards to study the advantages and disadvantages of adopting the metric system of weights and measures in the United States has been introduced in the House of Representatives.

The bill, H.R. 7401, was introduced by Rep. Overton Brooks (D.-La.) and referred to the House Committee on Science and Astronautics, of which he is chairman.

Hearings by a subcommittee are expected before Congress adjourns its current session.

The bill provides that the National Bureau of Standards conduct a program of investigation, research and survey to "determine the practicability" of changing from the present system of inches and ounces to the metric system of centimeters and grams.

Science News Letter, June 18, 1960

METEOROLOGY

New Weather Warning System Tried in Midwest

AN AUTOMATIC weather system that pinpoints lightning discharges from severe electrical storms over most of North America is now under test in the central United States.

The new method detects lightning discharges at a distance of 2,000 miles and relays the information to a central collection point.

The equipment, developed by the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J., is operated by personnel of the Air Weather Service.

It represents a further development of the so-called "sferics," a system of locating and tracking storms through the radio static caused by lightning.

The central station for the automatic weather system is at Kansas City, Mo., with six auxiliary stations in neighboring states. The detector stations are equipped with special radio receivers that pick up static generated by lightning.

Each station detects the discharges and simultaneously records the time and compass direction. This information is then relayed to the central monitor at Kansas City.

An electronic device plots and displays on a special map of North America the position of the lightning within a tenth of a second after receipt.

Thus an operator, watching the map, can follow increasing electrical activity that might indicate developing thunderstorms or possibly tornadoes.

When more stations are in operation, the new weather warning system will be particularly valuable in tracking electrical disturbances over ocean areas where there are no permanent observing stations. The system is reported in the current Weatherwise, 13:63, 1960, published for the American Meteorological Society in Boston.

Science News Letter, June 18, 1960

ROCKET WITH ECHO—The 28-inch canister on top of the Delta launch vehicle (above), built by Douglas Aircraft Co., Inc., Santa Monica, Calif., contains the folded 100-foot deflated Echo sphere. When ejected, the two hemispheres of the canister (right) will separate, allowing the plastic sphere to inflate and go into orbit about 1,000 miles above the earth. The canister weighs about 24 pounds. The sphere, made by the G. T. Schjeldahl Co., Northfield, Minn., for the National Aeronautics and Space Administration, weighs 166 pounds.

ROCKETS AND MISSILES

Echo Found Practical

12 to 24 Echo-type satellites would provide a nearly continuous communications network. Due to electronic advances, equipment is able to bounce signals off the satellite.

DEFENSE-ORIENTED scientists say the Echo satellite scheduled to be launched this year may be the most practical satellite the National Aeronautics and Space Administration has yet put up. The reason:

Echo is a major step toward a nearly invulnerable communications system for the military.

The system is badly needed. Transoceanic cables are crowded and can be sabotaged easily. Shortwave radio is also crowded and is dependent on favorable, but uncontrollable, atmospheric conditions.

But 12 to 24 Echo-type satellites uniformly spaced around the earth would provide a nearly continuous, world-wide network for bouncing messages from continent to continent.

An attempt to place an Echo satellite into orbit failed last May but a second attempt is planned in the next few months.

The man credited as father of the system is Dr. John R. Pierce, director of research in communications principles at the Bell Telephone Laboratories. He proposed the system in a 1955 paper.

"At that time I made calculations concerning the use of passive reflecting satellites that could be used to reflect microwaves," he said recently. There were no artificial satellites then.

Bell scientists are working closely with NASA on the Echo project. They say that when they attempt to bounce radio signals from coast to coast, the satellite's aluminized shell will reflect 98% of the waves up to frequencies of 20,000 megacycles.

The scientists are particularly interested in how space conditions will affect the satellite. The 100-foot Mylar plastic sphere will probably collapse when it moves into the earth's shadow. The sun's heat, which will have caused powders to turn into gas and swell the balloon, will then be gone.

Scientists also will be waiting to see if the satellite re-expands when it returns into the sunlight. They will be interested in leaks of gas that might be caused by punctures of the balloon by micrometeors.

And what of the plastic, a common one used in grocery packaging? Will heat, ultraviolet light and radiation make it deteriorate rapidly and lose its flexibility?

The purpose of the Echo experiment is to find out and thus to put the United States another step closer to a revolutionary new system of military communications.

Echo Could Be Jammed

Echo is almost as simple as a toy balloon, but the ground equipment needed to bounce waves off the satellite is extremely complicated. It is made possible due to spectacular electronic advances made since 1955.

Most important for Echo was the development of the maser, a new form of microwave amplifier. It amplifies radio signals with only about a hundredth of the unwanted noise of earlier amplifiers.

Thus radio signals sent to Echo need only about a hundredth of the power they would have needed five years ago.

Dr. Pierce told the House Committee on Science and Astronautics that Echo-type satellites may be troubled by unauthorized persons beaming radio signals at them.

"Satellites are completely in the public domain in a way that nothing ever before has been.

"They are up in the sky where everyone can see them and unfortunately anyone who wishes to could shoot radio signals at them."

Dr. Pierce said that if many persons have access to a satellite, they may accidentally jam one another.

"There is also the possibility, of course, that somebody would deliberately jam the satellites," Dr. Pierce said.

Science News Letter, June 18, 1960

ROCKETS AND MISSILES

Rocket-Borne Radiosonde To Send Weather Data

See Front Cover

A ROCKET-BORNE radiosonde, developed by the U. S. Army Signal Research and Development Lab, Ft. Monmouth, N. J., is loaded into the nose cone of a 77-pound Arcas rocket as seen on the cover of this week's SCIENCE NEWS LETTER.

The rocket will travel 40 miles up in the atmosphere where the radiosonde will separate from it and parachute slowly to earth, transmitting weather information.

Science News Letter, June 18, 1960

MEDICINE

Medical School Costs Now $2,911 Per Year

MEDICAL STUDENTS are spending $2,911 a year in medical schools across the country. That adds up to $11,642 for the four-year course, and the student and his family are footing 82% of the bill.

The other 18% comes from medical schools, Federal and state governments, and from local banks.

Financial statistics, compiled for the Association of American Medical Colleges, Evanston, Ill., show that of students receiving M.D. degrees in 1959, 43% came from families with incomes over $10,000. Only 14% came from families making less than $5,000 and the rest came from the middle-income group.

The AAMC said the figures demonstrate that lower income families simply cannot provide the amounts of money needed by the student to pay for the costs of his medical education.

"If we are to reach our goal of increasing the number of physicians to meet the nation's health needs, we must draw upon a broader socio-economic base within the population. To do this, financial assistance is necessary."

Whatever the family's ability to help out, four out of five medical students worked during the school year or summer vacation or both. Sixteen percent received no financial aid from their families. But eight percent managed to earn more than $6,000 a year. For some, a spouse's income helped to make ends meet.

The study revealed that many working students have jobs that have nothing to do with medical education. If such students were given more financial assistance, says the AAMC, they could still work, but could choose a relevant job even if it meant less money.

Science News Letter, June 18, 1960

ENTOMOLOGY

Flies Continue to Resist Man's Insect-Killers

HOUSEFLIES have an adaptable enzyme system that changes from one generation to another and lets these house pests resist man's insecticides, the New York State College of Agriculture, Cornell University, reported.

The Cornell scientists are looking for new insecticides to replace those to which flies have already become immune.

So far man has just barely been able to keep pace with the flies and develop a new insecticide when the old ones became ineffective.

By this time, the flies pay no attention to DDT and lindane is no longer very effective. The most promising new pest-killer, dimethoate, has yet to be approved by the Food and Drug Administration as it so far has defied chemical analysis.

Each time man develops a new insecticide, most of the flies sprayed are killed, but a few of them survive. These multiply and pass on their resistance to their offspring. Within three to five years the whole species is immune.

At Cornell, Prof. Roger Young is studying the enzyme that enables houseflies to resist DDT. Prof. David Pimentel is studying the effects of immigration on the resistance of fruit flies.

Prof. Pimentel is trying to find out how many non-resistant flies would be needed to keep down the resistance of an entire colony through inter-breeding. He is also making a comparative study of the effects different insecticides will have on resistance.

Prof. Thomas Eisner is studying the chemical weapons insects use against each other. Cockroaches, beetles and millipedes defend themselves with poisonous liquids and sprays. Dr. Eisner believes the insects could teach man about their own methods of warfare.

New insecticides are field-tested by Prof. John Matthysse who keeps colonies of resistant flies on which he tries the new insecticides.

Science News Letter, June 18, 1960

MILITARY SCIENCE

Foxhole Digger Built; Weighs 36,000 Pounds

A MACHINE that digs foxholes in a minute has been developed for the Army. It weighs 36,000 pounds.

No GI will ever carry it. But the mounted machine is highly maneuverable. It can travel at 30 miles an hour on improved roadway.

Under favorable soil conditions, the machine can dig a foxhole for one or two men in a minute. It can dig heavy machine gun emplacements in a little over three minutes and large horseshoe type emplacements in five minutes, provided soil conditions are not unduly adverse.

For digging, the machine has hydraulically operated boom hoist, rams, scraper and discharge conveyor.

The device is being bought in quantity by the Army. Unlike an earlier machine, the device cannot be air-dropped, but it has greater digging ability.

The machine was developed by the U. S. Army Engineering Research and Development Laboratory at Ft. Belvoir, Va.

Science News Letter, June 18, 1960

BIOCHEMISTRY

Single Cells Seen Useful In Heart Studies

SINGLE BEATING cells from rat hearts are expected to be useful in studying the food and other requirements of human hearts.

The microscopic cells could be used to tell how certain foods, or a lack of them, affect the beating of the single cells.

The cells of the rat heart were separated and grown in a test tube by Drs. Isaac Harary and Barbara Farley of the University of California at Los Angeles. How various heart drugs and energy-releasing compounds affect the beating rhythm of the cells is reported in Science, 131:1674, 1960.

Science News Letter, June 18, 1960

IN SCIEN

MEDICINE

Over-Use of Vitamin K Called Therapy Abuse

MASSIVE DOSES of vitamin K, a substance widely used to combat hemorrhaging, has caused anemia, vomiting, and further hemorrhaging in experimental animals, Drs. A. Marshall Smith Jr. and R. Philip Custer of Philadelphia report. They called the vitamin's indiscriminate use one of the "more patent abuses" in present-day therapy.

"Free use of these substances is made on the assumption that they are harmless, and the physician generally believes that he is doing something of real value for his patient by giving him vitamin K during a hemorrhagic episode."

"One should not be very censorious of physicians using vitamin K, however. The medical literature is virtually devoid of data relating to toxic effects of vitamin K."

Reporting in the Journal of the American Medical Association, 173:502, 1960, the doctors advise that large doses of vitamin K or related treatment should not be given to patients with significant liver disease, and even small doses should be given with caution to these patients.

In experiments at Philadelphia's Presbyterian Hospital, where Dr. Smith is a resident in medicine, the doctors found alterations in the liver function because of toxic effects from vitamin K.

Science News Letter, June 18, 1960

ASTRONOMY

New Director Appointed For National Observatory

DR. NICHOLAS U. Mayall, now on the staff of Lick Observatory, Mt. Hamilton, Calif., has been appointed director of Kitt Peak National Observatory, effective Oct. 1.

Kitt Peak is a national research center for optical astronomy operated by the National Science Foundation. It has a 36-inch telescope available now, and an 80-inch scheduled for completion next year.

Dr. Mayall was named to his new post by the board of directors of the Association of Universities for Research in Astronomy, Inc., (AURA), the nine-university group that operates Kitt Peak. The national observatory is located 40 miles southwest of Tucson, Ariz., on the Papago Indian reservation.

Dr. Mayall has recently specialized in spectroscopic studies of galaxies far distant from the Milky Way in which the sun and its planets are located. These studies help determine the distances, velocities and masses of such deep-space objects, each of which contains hundreds of millions of stars.

Science News Letter, June 18, 1960

E FIELDS

MEDICINE

Hospital Care Lacking For Russian Children

MANY CRITICALLY ILL Russian children must be treated at home in spite of major increases in the number of hospital beds, John F. Kantner of the Bureau of Census in Washington, D. C., reports.

In a recent year, 44% of the children who died from pneumonia in Russia's city areas died in their homes, Mr. Kantner writes in Population Trends in Eastern Europe, the USSR and Mainland China, a study published in New York by the Milbank Memorial Fund.

The percentage of home treatment reached 73% in one rural area of Russia in 1955, Mr. Kantner writes.

"There is evidence of certain deficiencies in the regular medical establishments and other institutions for child care which could contribute to a high incidence of deaths from pneumonia, as well as from other diseases."

Mr. Kantner reports inadequacies in the care of premature infants including "the use of hot water bags instead of incubators." He says a survey of hospitals in Baku showed that of 59 children who died from diphtheria in one hospital, only six had gotten anti-diphtheria shots.

The researchers also noted that Russian doctors assigned to out-of-the-way places sometimes did not show up. Because of these AWOLs there were 30 hospitals that had no physicians at all in one remote area.

Mr. Kantner says observations leave "little doubt" that the Soviet medical system is unevenly developed and that the conquest of disease is a broken, uneven front.

In contrast to the failures, "progress seems to have been made" in those areas where simple administrative actions or low cost preventive measures are effective. (See p. 396.)

Science News Letter, June 18, 1960

MEDICINE

New Drugs Reduce Patients' Cholesterol

CHOLESTEROL in cardiac patients can be effectively lowered by chemically denatured thyroid hormone without stimulating their diseased hearts.

This is reported by Drs. Eliot Corday of the University of California Medical School, Los Angeles, Henry Jaffe, University of Southern California Medical School, and David W. Irving, Ventura County Heart Association Research Fellow.

Thyroid hormone, thyroxin, is needed to break down cholesterol in the system, the investigators point out. People with sluggish thyroid glands do not produce enough thyroxin and thus are subject to high cholesterol levels, which have been implicated as a cause of heart disease and strokes.

Ordinarily such persons can be given thyroid extract to make up for this deficiency, they note. However, thyroxin is a potent heart stimulant and may cause the heart to beat too fast. Thus if a thyroid-deficient patient who also has heart disease is given thyroid extract, his heart may become overburdened from excessive stimulation.

Two new thyroid extracts—triapron and tetraiodothyroformic acid—are chemically denatured so that they do not stimulate the heart. The investigators have used the new drugs to treat 49 thyroid-sensitive patients, most of them with heart disease, over a 12-month period. In 40 of the patients a favorable cholesterol-lowering effect was noted.

No dietary restrictions were imposed upon the patients, the investigators added.

Science News Letter, June 18, 1960

MATHEMATICS

New Way of Predicting Lifetimes of Parts Found

A METHOD of predicting the reliability of equipment—how long parts will last before failure—has been devised by a mathematician.

The mathematical method is reported by Dr. R. F. Drenick of the Bell Telephone Laboratories, Murray Hill, N. J., in the Journal of the Society of Industrial and Applied Mathematics 8:125, 1960.

Reliability of equipment receives particular attention from manufacturers of electronic devices because such equipment is complex. An obstacle to his mathematical study, Dr. Drenick reports, was that the term "reliability" seems to have different meanings to different persons, and sometimes different meanings to the same person in different contexts.

Dr. Drenick found a new concept of reliability that is more general than current usage, but that reduces to concepts commonly used under appropriate conditions.

Science News Letter, June 18, 1960

MEDICINE

Patients Bring Staph Into Hospitals

RECENT HOSPITAL epidemics of staph may have been caused by patients who brought staphylococcal infections (staph) into the hospitals, a survey indicates.

Staph, which may be a factor in relapses and the slow recovery of hospital patients, has been blamed on lack of cleanliness in hospitals, but Dr. Marlin L. Cooper of Children's Hospital in Cincinnati, Ohio, reported that staph is a community problem.

A study made on 5,676 children as they were admitted to Children's Hospital showed that 45.9% carried staphlococcus aureus organisms in their noses or throats, and 8.2% carried those strains of the organism likely to cause epidemics.

Physicians in the hospital had a slightly higher percentage of staph themselves.

Science News Letter, June 18, 1960

CHEMISTRY

Chemical Coatings Help Alloys' Fatigue Strength

FATIGUE STRENGTHS of steel, magnesium, and copper-beryllium alloys are greatly increased when the metals are coated with a one molecule-thick layer of certain organic chemical compounds, research at the National Bureau of Standards has demonstrated.

Environment greatly affects the fatigue strengths of metals. Traces of water and oxygen from the air will cause surface corrosion. Even a slight amount of corrosion will considerably weaken the metal.

The coatings consist of molecules having at least seven carbon atoms in a chain with a "polar group," a group of atoms having a separation of electronic charge, at one end. These molecules tend to pack together with the polar groups attached to the surface of the metal to form the coating which keeps out the oxygen and water molecules.

Science News Letter, June 18, 1960

MEDICINE

Sheep Studies May Solve Human Pregnancy Puzzle

EXPERIMENTS with sheep may provide a clue to the mystery of toxemia of pregnancy—one of the major causes of death in expectant human mothers.

A research team, Dr. Nicholas S. Assali and Lawrence Longo, University of California Medical School, Los Angeles; Dr. Louis W. Holm, University of California, Davis; Dr. Yale Katz, University of Southern California, and Dr. Leon C. Chesley, State of New York University, is investigating a toxemia-like disease which occurs spontaneously among pregnant sheep.

Nine of ten symptoms of human toxemia, whose cause is unknown, are found in the sheep disorder. These include the fact that the disease occurs sporadically during the latter part of pregnancy in both humans and sheep, occurs more frequently in short, obese types, is more frequent with large or multiple fetuses, manifests itself in prominent nervous system and visual disturbances, convulsions and coma. A rapid improvement is noted in both humans and sheep following delivery.

One mystery about sheep toxemia is that high blood pressure, a characteristic of human toxemia, does not occur. This difference is being investigated at the present time. Spontaneous toxemia among sheep seems to be associated with lack of exercise. Physical stress such as snowfalls and rainstorms may precipitate the sheep disorder by a mechanism not yet clear.

So far the study of the disease in humans has not been productive as to its cause or cure. The disease can now be produced experimentally in sheep, which are gentle and easily managed animals for experimental work under carefully controlled conditions. For this and other reasons, sheep studies may determine the cause of human toxemia.

Science News Letter, June 18, 1960

PHYSICS

Most Powerful Accelerator

This summer U. S. scientists will operate an atomic accelerator at 30 billion electron volts, a machine more energetic than the world's highest now smashing atoms at Geneva.

By ANN EWING

TODAY, THE WORLD'S most powerful atom smasher is the 28-billion-electron-volt machine now operating under the CERN organization of 13 European nations at Geneva, Switzerland.

This summer, however, the United States will begin experiments at even higher energies with the 30-billion-electron-volt accelerator at Brookhaven National Laboratory.

With the CERN and Brookhaven particle accelerators, plus many others now under construction, scientists expect to learn new facts about the atom and its nucleus. The protons or electrons, given terrific speeds by the accelerator, are used as "bullets" to crash into atoms. The particles that come flying out tell scientists about atomic structure. To some extent, this can be done by studying the tracks of atomic collisions caused by cosmic rays.

In space, the cosmic rays that continuously bombard the earth's atmosphere are accelerated to much higher energies than those available from any man-made machine now in operation or being built.

However, it is much easier to trace what occurs when atomic cores disintegrate if the collisions are produced in the known conditions of atom smashers.

Accelerators are used as "microscopes" to help scientists "see" inside the atomic nucleus, where distances are measured in fractions of a trillionth of an inch. The greater the energy of accelerated particles, the easier it is for scientists to "see" the detailed structure of the nucleus.

By studying the results of atomic smash-ups in high energy accelerators, scientists have found that the structure of atomic nuclei is not as simple as was once thought. Some 32 "elementary" particles are now known, and about half of these are anti-matter, a state opposite to that of ordinary matter. When an anti-proton and a proton collide, for instance, both particles are annihilated and matter is turned into energy.

Naturally radioactive materials, such as radium, were first used to bombard atoms and thereby learn more about how atoms are constructed. The energies involved in these early studies were only a few thousand electron volts.

The first man-made accelerators gave the particles less energy than that of natural radiation, but paved the way for more powerful ones. The first in the billion-volt range were constructed during the early 1950's in the U. S.

The CERN machine reached energies of some 24 billion electron volts late in 1959, then in 1960 it operated at a power level of 28 billion electron volts, usually abbreviated to Bev. Until late 1959, however, the Russians were operating the world's most powerful machine, a 10-Bev accelerator at Dubna, Russia. The USSR several years ago announced plans for building a 50-Bev proton synchroton, but little definite information on its progress has been released since then.

Basically, all accelerators consist of a source of particles, usually protons or electrons, to be accelerated, and a high vacuum chamber in which the particles can move without colliding too frequently with air molecules. Acceleration is achieved by giving the particles successive electric "kicks," and they are kept in position to receive these jolts by magnetic fields.

Atom smashers are broadly subdivided into two classes, linear and circular. Both the CERN and Brookhaven proton accelerators are circular and use the so-called strong focusing method to keep particles on their assigned paths.

Linear atom smashers are often used as pre-accelerators for the very large synchrotrons, as well as on their own.

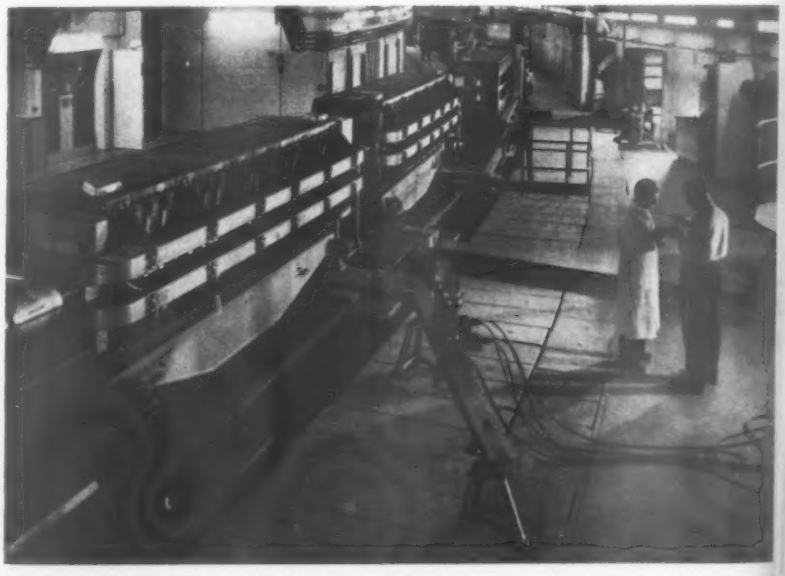
The most ambitious plan for a linear accelerator involves building a machine two miles long at Stanford University in California. Congress has before it a request to authorize design and construction of such a high-energy electron accelerator.

It would be a "big brother" to the Mark III linear machine that has been successfully operated at Stanford with energies as high as 730 thousand electron volts. The Mark III is now being extended from 220 feet to 310 feet to allow operation at about 1.2 Bev.

The proposed two-mile accelerator would provide a ten-Bev electron beam, with an intensity some 50 times greater than that available from a circular electron machine.

Two U. S. circular accelerators currently in operation at Cornell University, Ithaca, N. Y., and California Institute of Technology impart to electrons energies of up to 1.5 Bev. The Russian newspaper Pravda recently announced that a four-Bev linear accelerator for electrons was under construction at Kharkov. A one-Bev circular machine is in the design stage in Russia.

When it is completed later this year, the six-Bev synchrotron being built jointly by Harvard University and Massachusetts Institute of Technology will be the most powerful electron accelerator in the world. The energy available for reactions with six-Bev electrons is the same as for 9.5 Bev protons, so that large numbers of the strange particles inhabiting atomic nuclei are expected to be produced in this machine, despite the fact that electrons are



MOST POWERFUL ATOM SMASHER—The most advanced tool of nuclear research in the world is the 28-billion-electron-volt particle accelerator now operating in Geneva under the direction of CERN. The interior view here shows a few of the 100 units of the 3,800-ton magnet that provides the field guiding the particles during acceleration.

much weaker in their interactions with matter than are protons.

For accelerating protons, the U. S. now has two large machines in operation, a three-Bev synchrotron known as the cosmotron at Brookhaven National Laboratory and a 6.2-Bev synchrotron called the bevatron at the University of California's Lawrence Radiation Laboratory in Berkeley.

Besides the 30-Bev Brookhaven machine, two other large ones are under construction in the U. S.

One, a joint venture of Princeton University and the University of Pennsylvania, will be a three-Bev proton synchrotron. It is scheduled for completion by the end of 1960. Although similar to the cosmotron, it is designed to provide a much higher number of protons per second in its beam, thus making possible experiments on nuclear events that otherwise occur too rarely for successful study.

The second is a 12.5-Bev proton accelerator under construction at Argonne National Laboratory, Lemont, Ill. It is scheduled for completion in 1962.

The Soviet Union has scheduled a seven-Bev proton synchrotron for operation in 1960.

From this summary it can be seen that, excepting the 50-Bev machine proposed by the Russians about which little is known, the U. S. will have the largest and most sophisticated atom smashers of the world in operation by the end of this year.

It is noteworthy, however, that the 13 nations forming CERN are also building rather large machines on their own. The 13 nations are Austria, Belgium, Denmark, France, West Germany, Greece, Italy, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and Yugoslavia.

In the United Kingdom, a seven-Bev proton synchrotron is under construction by several British universities. In France, a three-Bev proton accelerator was placed in operation in 1958 and a one-Bev linear accelerator is nearing completion. In Italy, a 1.2-Bev electron accelerator began operation in 1959. In the Netherlands, a proton synchrotron is being built. Electron accelerators are under construction in West Germany and Sweden.

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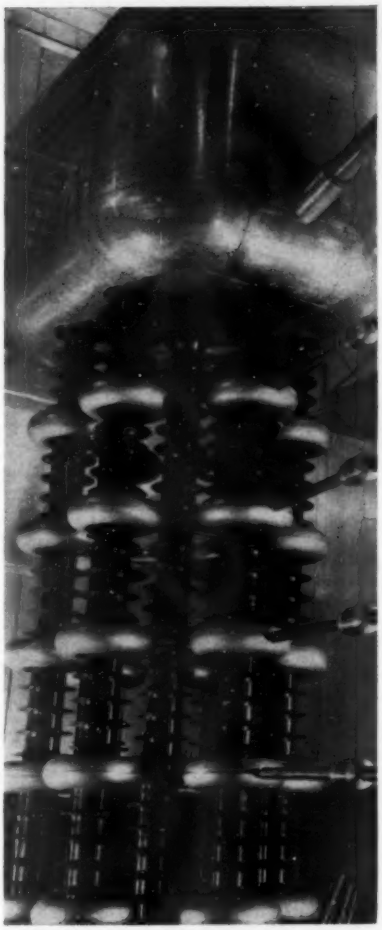

INITIAL ACCELERATION — This Cockroft-Walton generator provides the initial acceleration of 750,000 electron volts to protons that are shot into a 50-million-electron volt linear accelerator. The protons then enter the orbit of the Brookhaven 30 Bev alternating gradient synchrotron.

METEOROLOGY

Natural Air-Conditioning

SAN FRANCISCO has a completely automatic, built-in air conditioning system that not only gives it cool summers and mild winters but also results in substantial economic advantages to commercial jet aircraft operators.

San Francisco has mean summer temperatures lower than those of any other large city in the United States.

In July, the average maximum temperature is a cool 64 degrees. In September, the warmest month, highest temperatures average a comfortable 68 degrees, Halbert E. Root of the U. S. Weather Bureau at the San Francisco International Airport reported.

Mild weather in the San Francisco Bay area is due to its particular location on the eastern shores of the Pacific Ocean and to its topography. These combine to provide what amounts to a natural air-conditioning system, Mr. Root reported in the current issue of Weatherwise, 13:47, 1960, published for the American Meteorological Society in Boston.

In the present age of jet-powered aircraft, the cool temperatures and brisk winds of this air-conditioned region provide great advantages for air travel. These result from the fact that the thrust of a jet engine depends directly on the density of the air, the density being greater at lower temperatures, and that each mile per hour of headwind on take-off means less speed need be provided by the plane's engines in order to reach flying speed.

When compared to a nearly inland location, jet planes departing from San Francisco International Airport could carry an average of as much as 12,000 pounds more per flight, Mr. Root reported.

San Francisco's air-conditioning system also supplies sailing enthusiasts with exciting sport to test their skill. At the peak of flow on a normal ebb tide, the water is rushing out under Golden Gate Bridge at a rate of about 4,600,000 cubic feet per second, about seven times the flow of the Mississippi River.

Science News Letter, June 18, 1960

PHYSICS

Strained Metal Foil Shows Structure

USING AN ELECTRON transmission microscope and motion picture techniques, research workers at the University of Cambridge, England, are now able to watch what actually happens to metal foils when they are strained to breaking point.

Dr. P. B. Hirsch and Prof. A. H. Cottrell, both of Cambridge, have found that structures "virtually down to the atomic scale can be seen for the first time."

They hope the method will enable scientists to understand thoroughly how the engineering properties of solids result from atomic structures.

The new technique has been used, for example, to watch what happens when a pure metal is suddenly cooled from high temperatures, to find out how nuclear radiation damages metallic crystal structures, and to follow the arrangements and dislocations that occur when a metal foil is gradually strained to its breaking point.

Science News Letter, June 18, 1960

MILITARY SCIENCE

Device to Stage Battles With Nuclear Subs

THE NAVY'S Submarine School in New London, Conn., is getting a $3,600,000 nuclear submarine training center that will provide realism in waging mock sea battles. To be built by Minneapolis-Honeywell Regulator Company, the new training facility will utilize a giant computer and electronic techniques to duplicate, in color, the attack centers of three nuclear submarines.

Science News Letter, June 18, 1960

TECHNOLOGY

Largest Nuclear Power Reactor Operating Well

THE NATION'S largest operating nuclear power reactor has performed "outstandingly well" during its initial test run, the General Electric Company and Commonwealth Edison Company have reported.

The reactor forms the heart of the huge Dresden Nuclear Power Station at San Jose, Calif. It produced nearly 25,000,000 kilowatt hours of electricity while operating at power levels up to 90,000 kilowatts for its two-week test.

Science News Letter, June 18, 1960

• Books of the Week •

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

AEROSPACE DICTIONARY—Frank Gaynor, introd. by Wernher von Braun.—*Philosophical Lib.*, 260 p., $6. Reference on essential terminology in space exploration from "AAM" to "zip fuel,, describes type and mission of guided missiles and satellites that achieved orbit.

THE ARTHRITIS HOAX: $250,000,000 in Frauds and Fallacies—Ruth Walrad for Arthritis and Rheumatism Foundation—*Public Affairs Pamphlet*, #297, 20 p., illus., paper, 25¢, direct to publisher, 22 E. 38th St., New York 16, N. Y.

BASICS OF INDUCTION HEATING, 2 Vols.—Chester A. Tudbury—*Rider*, 132 p., 133 p., illus., $8.90 per set; paper, $7.80.

BIOCHEMISTRY OF STEROIDS—Erich Heftmann and Erich Mosettig—*Reinhold*, 231 p., $6.90. Concise source of information on the biochemical aspects of steroid hormones.

COLLEGE ENTRANCE EXAMINATIONS—Louis K. Wechsler, Martin Blum and Sidney Friedman—*Barnes & Noble*, 305 p., illus., paper, $1.95. Practice tests, exercises, aptitude and achievement tests for students preparing for college.

DESIGN FOR A BRAIN: The Origin of Adaptive Behaviour—W. Ross Ashby—*Wiley*, 2nd rev. ed., 286 p., $6.50. Based on fact that the nervous system behaves adaptively and the hypothesis that it is essentially mechanistic, the author attempts in mathematical form to deduce what sort of mechanism it must be to behave so differently from any machine made so far.

THE DYNAMIC BEHAVIOR OF THERMOELECTRIC DEVICES—Paul E. Gray—*Wiley*, 136 p., $3.50. This Technology Press Research Monograph investigates the small-signal dynamic behavior of thermoelectric devices.

EFFECTS OF TRAFFIC CONTROL DEVICES—Anthony J. Galioto and others—*Highway Res. Bd.*, Bull. 244, 97 p., illus., paper, $1.80. On the effects of curb parking on intersection capacity, and other traffic experiments.

ELECTRICAL CONTACTS, 1959—W. L. R. Henderson and others—*Pa. State Univ., College of Engineering*, 129 p., illus., paper, $5. Papers presented at the 1959 Engineering Seminar, in the areas of static, arcing, and sliding contacts.

ELECTROMAGNETIC ENERGY TRANSMISSION AND RADIATION—Richard B. Adler, Lan Jen Chu and Robert M. Fano—*Wiley*, 621 p., $14.50. Treats electromagnetic waves and oscillations in one, two, and three space dimensions, using time-domain, complex-frequency-domain, and energy points of view.

EPIDEMIOLOGY AND MENTAL ILLNESS—Richard J. Plunkett and John E. Gordon—*Basic Bks*, 126 p., $2.75. Sixth monograph of the Joint Commission on Mental Illness and Health.

THE ETIOLOGY OF SCHIZOPHRENIA—Don D. Jackson, Ed.—*Basic Bks.*, 456 p., illus., $7.50. Leading specialists and practitioners present genetic, biochemical, dynamic, physiological, psychological and socio-cultural aspects of schizophrenia.

THE EXPLORATION OF THE SOLAR SYSTEM—Felix Godwin—*Plenum Press*, 200 p., illus., $6.50. Nineteen-year-old British physics student outlines in detail future developments in astronautics, expeditions to moon, Mars and Venus, and discusses the potential work of interplanetary explorers. Experts consider the book a valuable contribution to the literature of astronautics.

THE HARVEY LECTURES, 1958-1959—Francois Jacob, V. B. Wigglesworth and others—*Academic*, 312 p., illus., $7.50. On genetic control of viral functions, on metamorphosis and body form, and other research.

HEAT TRANSFER—Alan J. Chapman—*Macmillan*, 452 p., $9. Textbook presenting the fundamental approach in a rigorous manner.

INDEX TRANSLATIONUM: International Bibliography of Translations, Vol. 11—*UNESCO, (Columbia Univ. Press)*, 730 p., $20.50; paper $18.50. Lists 30,000 translations published in 64 countries in 1958; each national bibliography subdivided into ten classifications.

INTRODUCTION TO ATOMIC ENERGY—William G. Atkinson—*Rider*, 68 p., illus., paper, $1.35. Short primer explaining fundamental terms.

INTRODUCTION TO COLLEGE PHYSICS—Rogers D. Rusk—*Appleton*, 2nd ed., 944 p., illus., $8. Introductory textbook for the general student.

INTRODUCTION TO MODERN NETWORK SYNTHESIS—M. E. Valkenberg—*Wiley*, 498 p., $11.75. Basic methods of network synthesis, including applications to communications and automatic control systems.

MAN AGAINST AGING—Robert S. de Ropp—*St. Martins*, 310 p., $5. Biochemist reviews for the general reader the major findings of experimental research in the fields of the physiology and chemistry of the aging process.

MAYA CITIES—Paul Rivet, transl. from French by Miriam and Lionel Kochan—*Putnam*, 234 p., illus., $5.95. Abundantly illustrated summarization of the essential facts known about the Mayan civilization.

MILK PRODUCTION AND PROCESSING—Henry F. Judkins and Harry A. Keener—*Wiley*, 452 p., illus., $7.95. Orientation course in dairying.

MOVER OF MEN AND MOUNTAINS: Autobiography—R. G. LeTourneau—*Prentice-Hall*, 282 p., photographs, $3.95. Personal story of the inventor of complex earth-moving machinery.

OPERATIONS RESEARCH AND SYSTEMS ENGINEERING—Charles D. Flagle, William H. Huggins and Robert H. Roy, Eds.—*Johns Hopkins Press*, 889 p., illus., $14.50. Compendium on the meaning, use, and importance of the various disciplines concerned with the operation of total systems, human organization, man-machine systems, or complex physical systems.

PHYSICS OF PRECIPITATION: Geophysical Monograph No. 5—Helmut Weickmann, Ed.—*Am. Geophysical Union*, 435 p., illus., $12.50. Proceedings of the Second Cloud Physics Conference at Woods Hole, Mass., June 3-5, 1959.

POPULATION TRENDS IN EASTERN EUROPE, THE USSR AND MAINLAND CHINA: Proceedings of 36th Annual Conference, 1959—*Milbank Memorial Fund*, 336 p., paper, $2. About demographic changes and manpower trends in Communist-controlled countries which account for about one-third of the world's population today. (See p. 393)

PROCEEDINGS OF THE 1960 HEAT TRANSFER AND FLUID MECHANICS INSTITUTE—D. M. Mason, W. C. Reynolds and W. G. Vincenti, Eds.—*Stanford Univ. Press*, 259 p., illus., paper, $8.75. Preliminary edition of papers presented at 13th Institute, June 15-17, 1960, at Stanford.

THE RUSTY LIZARD: A Population Study—W. Frank Blair—*Univ. of Texas Press*, 185 p., illus., $4.50. Intensive study of the dynamics of a lizard population on a ten-acre tract, readable for the layman, and a significant contribution ecology.

SCIENTISTS IN GOVERNMENT—Earl W. Lindveit, foreword by Edward A. Meyerhoff—*Public Affairs Press*, 84 p., $3.25. Called a "diagnostic anatomical guide to science and engineering in Washington." Covers policy formation, training, recruitment and retention of scientists, and the climate for scientific research.

THE SEARCH FOR NEW ANTIBIOTICS: Problems and Perspectives—G. F. Gause—*Yale Univ. Press*, 97 p., illus., $4.75. Based on Trends in Science lecture at Yale, December 1959, by the Director of the Institute of Antibiotics of the Academy of Medical Sciences, Moscow.

THORACIC SURGERY BEFORE THE 20TH CENTURY—Lew A. Hochberg, foreword by Edward D. Churchill—*Vantage*, 858 p., illus., $15. The history of chest surgery, from the beginnings in Egypt, through Greek, Roman, Arabian, European and American precursors of today's thoracic surgeons.

THE TRUE BOOK ABOUT MAN—Patrick Moore—*Muller (Sportshelf)*, 142 p., illus. by P. Cullen, $2.75. Short history of earth and man. For young people.

VISTAS IN ASTRONOMY, Vol. 3—Arthur Beer, Ed.—*Pergamon*, 345 p., illus., $18. International coverage of contemporary astronomical research, emphasizing new techniques and methods and their interactions with theoretical developments.

VOYAGE INTO DARKNESS: To Alaska with Bering—W. J. Granberg—*Dutton*, 190 p., $3. Story of an expedition, for young people.

YOUNG SCIENTIST TAKES A RIDE: Guide to Outdoor Observations from a Car Window—George Barr—*Whittlesey House*, 160 p., illus. by William D. Hayes, $3. Directs attention to many thought-provoking sights, sounds and other observations by those riding in a car.

Science News Letter, June 18, 1960

ORNITHOLOGY

African Cattle Egret Seen in Missouri

A CATTLE EGRET, a native African bird rare in the United States, has been sighted for the first time in the Trimble Wildlife area, Clinton County, Mo. Ted Pucci, regional reporter for the National Audubon Society, identified the rare bird, which is smaller than the American egret and has different coloring. The cattle egret has been spreading its range to South America and northward into the U. S. in recent years.

Science News Letter, June 18, 1960

ICHTHYOLOGY

Huge Shrimp Harvest Neglected in Indonesia

SMALL AND LARGE shrimps are so plentiful in Indonesian waters that experts estimate that more than one million pounds per month could be harvested, but the industry is so underdeveloped that fishermen catch only about twice as much as they can eat themselves. The U. S. Department of the Interior reports there are no foreign companies engaged in shrimp fishing in Indonesia, nor are there any facilities either for increasing the catch or for its efficient marketing.

Science News Letter, June 18, 1960

ENTOMOLOGY

Wasps May Control Pests

AN INSECT rearing technique developed at Riverside, Calif., may lead to bombarding a major citrus pest with millions of its enemies.

If grower organizations can raise natural enemies cheaply and in great numbers, they may be able to control the pest for the same cost as insecticide—but without harmful side effects.

The pest is California red scale, worst of all the insects attacking California oranges, lemons and grapefruit.

The "good" insect is a tiny wasp imported by the University of California from China. It is called *Aphytis lingnanensis*.

Success of the scheme hinges on getting 4,000 female wasps a year into each citrus tree, Dr. Paul DeBach explains in a new University of California publication, "Commercial Mass Culture of the California Red Scale Parasite," Bulletin Number 770.

Written with technician Ernest White, also of the Citrus Experiment Station, Riverside, the bulletin gives full instructions on rearing and releasing of the parasitic wasp. Aphytis stings the scale and lays its eggs on it. Hatching Aphytis larvae then eat and kill the scale.

In coastal areas of moderate climate, Aphytis wasps are usually able to control the scale unaided if insecticides are not used. In intermediate climatic areas, periodic release of the wasp has worked well in test plots.

In more rigorous climates farther inland, Dr. DeBach cautions, insectaries would have to distribute new colonies of wasps each month to boost their effectiveness, using a better-adapted strain, tolerant to greater variations of temperature.

Such a wasp has been developed by the Riverside scientists. It is currently undergoing field tests for possible use by growers.

Already the principal insect pest in most California citrus areas, red scale has spread in recent years to the Central Valley, mainly in Tulare, Fresno, and Kern Counties. In Ventura County, where the scale is becoming more serious, a growers' cooperative insectary is going into mass production of Aphytis.

Upwards of 4,000 red scales can infest a single fruit. Several million of the sucking insects may attack a tree, severely injuring leaves, twigs, and branches, and ruining the appearance of fruit.

To combat scale, tremendous numbers of parasites must be used. A two-man insectary can produce 176,000,000 female parasites a year for release over a nine-month period.

Colonization is fairly simple. A half-pint carton containing 4,000 females is set in a tree in the center of each nine-tree block in the orchard. When the lid is removed the parasites rapidly disperse through the tree and fly to adjacent trees until they occupy all scale-infested trees.

Total cost per year to run the insectary would be $17,000, the Riverside scientists estimate. This includes the expense of placing parasites in the orchard.

Science News Letter, June 18, 1960

SEISMOLOGY

Quakes 31 Miles Deep

THE EARTHQUAKES in Chile extended 31 or more miles below the surface of the earth, seismologists at the U. S. Coast and Geodetic Survey believe.

The scientists are now collecting and analyzing data from the quakes. They report 11 major quakes out of a total of about a thousand. They do not expect those to be the last from Chile. After shocks can be expected for several months.

Each quake produces three types of waves that are recorded by seismologists around the world. The primary and secondary waves come through the earth's interior. The third is a surface wave that follows the outside of the earth.

By studying the time intervals between the waves, a seismic expert can calculate the distance of the quake. Reports of the seismic waves also help determine quake depth.

Quakes can be several hundred miles deep. Shallow quakes, however, are only about 15 miles deep.

Chile is in a particularly bad part of the Pacific earthquake belt, which rims the Pacific and runs through Japan, the Philippines, Alaska and the West Coast of North America.

In 1922, 1928 and 1939, Chile experienced earthquakes of magnitudes nearly as great as the biggest of the recent series.

Science News Letter, June 18, 1960

Additional Quakes

A NEW major earthquake rocked disaster-hit southern Chile June 6, the U. S. Coast and Geodetic Survey reported.

The Chile quake registered in Washington, D. C., at 6:08, Greenwich time. The Survey reported authorities in Santiago said the quake was of the seventh magnitude.

Two quakes hitting off California's coast on June 3 and June 5 had no direct connection with the earthquakes in Chile. They occurred in the Cape Mendocino Escarpment, an underwater mountain ridge that heads out into the Pacific Ocean from Eureka, Calif.

The first California quake struck on June 4 at 2:33, Greenwich time. The second one hit on June 6 at 001:25, Greenwich time, at 40 degrees north and 126.5 degrees west, about 120 miles out in the ocean. It had an estimated magnitude of six, or about as strong as the quakes in North Africa and Iran earlier this year.

However, although thousands of people were killed in the quakes in Africa and Iran, no casualties or damage are reported from the quakes off California as they happened at sea.

Science News Letter, June 18, 1960

ASTRONOMY

Red Nova Over Chile On Eve of Earthquakes

JUST BEFORE the series of devastating earthquakes hit Chile, astronomers there discovered a nova of fifth magnitude, visible to the unaided eye but too far south to be seen from the United States.

The nova is red in color and is located near the third magnitude star Gamma in the constellation of Triangulum Australe.

A nova is a star that suddenly increases in brightness and then fades back into obscurity. It may brighten in a matter of a few days, then fade to magnitude 15 or 16 during a period of one to two years.

Science News Letter, June 18, 1960

ENTOMOLOGY

Termites May Be Hardy

NORTHERN home owners may be in for one of the plights of their southern counterparts—namely, termites.

Entomologists at the University of Wisconsin suspect that termites may be undergoing evolutionary changes resulting in a winter-hardy relative of the traditionally southern pest.

With the number of northern areas reporting an increasing amount of termites, T. C. Allen, R. D. Shenefelt and G. R. Esenther are cooperating with the U.S. Forest Products Laboratory at Madison, Wis., in studies to determine why the termites are this far north and if they can develop winter tolerance.

There is still no definite answer, but there is evidence that termites can become cold-hardy, the first time such an occurrence has been observed for insects of this class.

Termites collected during the summer, they report, entered "cold stupor" or immobilized sleep at 38 degrees Fahrenheit. But those the researchers collected in late August and September survived temperatures near 38 degrees for almost two months longer than those collected earlier in the summer.

The entomologists are also relating winter soil temperatures to termite survival and have found living termites in December, most of which were in the upper six inches of soil—the same depth as the frost line.

A good clean-up campaign may be the best control against these invaders, the researchers report. They advise people in infested areas to clean up wood and paper debris, and to remove wood from buildings, sheds and garages where it is in contact with the earth.

Termites behave differently from other insects. They eat wood for its cellulose content, so they attack books as well as fence posts and building materials. Protozoa live in their intestines and help digest the cellulose, being kept well fed and moist by the host termites.

Such a system of mutual existence is termed symbiosis.

Science News Letter, June 18, 1960

MEDICINE

Check-ups Urged During Treatment for Fungus

GRISEOFULVIN, an oral antibiotic for combating superficial fungus infections, is discussed in the May issue of the American Medical Association's Archives of Dermatology 81:760, 841, 1960. The issue reports on investigators in 11 countries.

A dermatology professor at the University of Mexico wrote that "deep mycoses (or fungus diseases) are frequent in Mexico and that griseofulvin had been in use soon after the first reports of the success of the drug for humans before the end of 1958."

In the Mexican study carried on since January, 1959, Dr. F. Latapi found that results were good in several cases of sporotrichosis and mycetoma, the two deep fungus diseases encountered most frequently in Mexico.

Dr. Latapi did not recommend griseofulvin as a practical substitute for potassium iodide therapy in sporotrichosis in every case.

In the case of mycetoma, advanced bone involvement did not respond well, and in the treatment of chromoblastomycosis, the most superficial of the deep mycoses, the results seem poor.

Five Detroit doctors reported good effects of prolonged administration of griseofulvin on the liver and kidneys as well as on the blood cells.

Drs. Clarence S. Livingood, Mac Brannen, Richard L. Orders, Jerome B. Kopstein and John W. Rebuck recommended that "urinalysis should be done routinely before griseofulvin therapy is instituted," and that during treatment, reports should be made at three- to four-week intervals.

Although the reactions of patients were generally good, some of the reports warned that there may be possible increased resistance to griseofulvin by the fungi after continued treatment.

Science News Letter, June 18, 1960

MEDICINE

X-Ray Help Eliminate Dwarf Strain in Cattle

VETERINARIANS FROM Pennsylvania State University have X-rayed the backbones of 300 Purebred Hereford calves on the Falklands Farms to weed dwarfs from the herd.

The veterinarians have found that if the X-ray shows the last four or five thoracic vertebrae, located at the base of the spine are compressed, the calf will be a dwarf or a carrier of the dwarf gene.

Thus, by separating these animals from the rest of the herd, stock owners hope to eliminate dwarf strains entirely and assure higher beef production.

Science News Letter, June 18, 1960

Questions

MEDICINE—How many volunteers received live polio vaccine in the Miami area? p. 387.

METEOROLOGY—What is the average maximum temperature in San Francisco in July? p. 395.

ROCKETS AND MISSILES—What was the most important electronic development for the Echo satellite? p. 391.

Photographs: Cover, U. S. Army; p. 387, Chatham Electronics of Tung-Sol Electric Inc.; p. 391, National Aeronautics and Space Administration; p. 394, European Organization For Nuclear Research; p. 395, Brookhaven National Laboratory; p. 400, Franklin Metal and Rubber Co.

Do You Know

The death rate from all *communicable diseases* in the U.S. declined 75% between the five-year period ending in 1934 and the four-year period ending in 1958.

A small electronic *tube* called the Astracon is so sensitive that it makes visible to the eye every individual elementary particle of light that triggers its ultra-sensitive input, making it the near ultimate of light amplification.

CIVIL ENGINEERING

Highway Research Urged By Research Board

A $34,000,000 national program of highway research has been recommended by a unit of the National Academy of Sciences-National Research Council. The program would run for four to five years. The Highway Research Board's report suggests research might show that nuclear energy could be practically used to turn inexpensive clay into useful highway materials.

Science News Letter, June 18, 1960

AERONAUTICS

Jet Engine Could Go 2,000 Miles Per Hour

A TYPE of jet engine to power military and commercial transport aircraft at speeds up to 2,000 miles an hour can be built whenever it is needed, a subcommittee of the House Science and Astronautics Committee has been told. J. B. Montgomery, general manager of General Electric Company's flight propulsion division, said the new engine would burn fuel in the exhaust of a fan mounted directly behind the basic jet engine.

Science News Letter, June 18, 1960

New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 1044. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

EASY CLAM OPENER holds a clam steady in a maple base while an attached knife cuts between the shell halves and a wedge spreads the shells open. The knife is attached to the base in an arrangement like a paper cutter. The base has a scooped out hollow to hold clam juice.

Science News Letter, June 18, 1960

CONVERTIBLE HAT can do duty as a street hat, bowler or casual. The man wearing it simply shapes it as he likes and snaps on one of the hat's interchangeable bands. The manufacturer claims the hat can be folded, pocketed or even sat on without damage.

Science News Letter, June 18, 1960

BIRD MODEL KIT provides model parts, brush and paints for assembling and painting a game bird. Painting is "by the numbers." Kits are available for the bald eagle, mallard duck and ring-necked pheasant.

Science News Letter, June 18, 1960

THUMB-CONTROLLED HOSE NOZZLE, shown in the photograph, provides easy, one-hand control in watering lawns and gardens. User can flip the

nozzle's control with his thumb to adjust for any spray, from mist to stream. The nozzle is made of chrome-plated metal.

Science News Letter, June 18, 1960

ROBERTS RULES CARD, pocket-sized, is handy for quick reference. About 350 points of order, legislative rules and major motions are condensed on the plastic card with sliding insert. The legislative device operates like a slide rule.

Science News Letter, June 18, 1960

TOY SAFE VAULT features a burglar alarm and the trademark of a major manufacturer of real bank safes. The safe has a slide out coin drawer, drawstring money bags and a combination lock.

Science News Letter, June 18, 1960

DISPOSER ADAPTER KIT converts a garbage disposer into a compact floor unit to eliminate the problems of sink installation. The kit includes a three-legged stand, an 18-inch bowl sink and a manual starter switch.

Science News Letter, June 18, 1960

ONE-LEVER OUTBOARD CONTROL permits the operator to go forward or reverse and accelerate or decelerate by movement of one lever. The usual outboard motor remote control has a lever for throttle and a second for gearshift. The new device is made of metal and nylon. Existing cable controls may be used when the device is installed.

Science News Letter, June 18, 1960

Nature Ramblings

By HORACE LOFTIN

THERE IS NO MORE apt description of a man without teeth than "toothless as a bird.

Of all the vertebrate animals, from fish to man, the birds are the only major group characterized by absence of teeth. There are creatures here and there without these useful tools, such as the turtles, but these are the exceptions to the rule.

Even the lowest forms of fishes, the lampreys which completely lack jaws, have tooth-like structures with which they rasp away the flesh of their prey.

Sharks and bony fishes in general have a mouthful of teeth, variously shaped for biting, crushing and holding.

As a group the amphibians are fairly well toothed, including some teeth on the roof of the mouth in many forms. These amphibian teeth are generally small, pointed, and serve mainly in holding and forcing food into the throat.

Reptilian teeth are typically pointed for holding of prey, and they lack roots. Snake

A Tooth for Every Job

teeth are generally curved backward and may occur in several rows on the jaws as well as on the roof of the mouth.

The snake's lower jaw can be unhinged in the middle. It feeds by alternately moving one half of the jaw, then the other, dragging the prey down into its throat by the recurved teeth.

We have already noted that birds are all lacking in teeth. Yet it was not always so! Remains of the oldest fossil bird known have jaws well equipped with reptile-like teeth.

Bird teeth have been lost in evolution, perhaps in part as a means of reducing the weight of the head region as an aid to flight.

Mammals represent the last word in variety and structure in dentition. Each kind of mammal has evolved its own particular array of teeth to conform with its needs.

This is so true that the identity of a mammal can often be determined on the basis of one or a few teeth.

The "primitive" number of teeth in the mammals is 44. Opossums have 50, but most show a reduction from the basic pattern.

Man, for example, has 32 teeth, while the rodents may boast of only 16— though they can do a lot of gnawing with those few.

Mammalian teeth are generally specialized into four kinds: incisors in front for cutting, canines for stabbing, premolars and molars for grinding and shearing.

Science News Letter, June 18, 1960